The Trail Modeling and Assessment Platform (T-MAP)

A Practitioner-Rooted Research Project

Liz Thorstensen
Vice President of Trail Development, Rails-to-Trails Conservancy

Greg Lindsey
Professor, School of Public Affairs, University of Minnesota

NATMEC
July 1, 2014
RTC 101

- Founded in 1986
- 150,000 Members and supporters
- HQ in DC with 4 Regional Offices
- 40+ Staff
Our Mission

“To create a nationwide network of trails from former rail lines and connecting corridors...

...to build healthier places for healthier people.”

- Adopted Oct 2004
Our Methods:
Catalyzing Change in 3 Spheres

#1
Changing Public Policy

#2
Changing Public Infrastructure

#3
Changing Personal Behavior
Our Methods:
Catalyzing Change in 3 Spheres

#1 Changing Public Policy

#2 Changing Public Infrastructure

#3 Changing Personal Behavior

T-MAP
T-MAP by Component

1. Geographic Data
2. Trail System Connectivity
   - Trail Use
   - Economic Impacts
3. Communication Advocacy Making the Case

Components:
- Geographic Data
- Trail User Attributes
- Counts
NOAA Climatic Regions & Study Cities

*Philadelphia is joined project (during NATMEC!!!)!
*If interested in joining – see Liz or Greg after session.
TMAP: Connectivity, Use, Impact

Objectives

• Monitor trail traffic at 45-50 locations in 12-13 cities in 9 climatic regions for $\geq 1$ year
• Describe patterns & variation in trail traffic
• Develop hourly, day-of-week, monthly, and day-of-year factors
• Develop models for estimating trail use
• Support trail development efforts
Monitoring & Modeling Trail Traffic

Tasks (follow TMG, NCHRP 07-19!!!)
- Installation (nearly done)
- Validation (in field)
- QA / QC (cleaning)
- Correction
- Factoring
- Modeling
Factoring Trail Traffic: Establish Factor Groups

- Differentiate bikes and peds
- Miranda-Moreno, Nosal, Schneider, & Proulx (2013)

\[ WWI = \frac{V_{we}}{V_{wd}} \]

\[ AMI = \frac{V_{am}}{V_{mid}} \]

*\( V_{we} \) is mean daily weekend traffic volume
*\( V_{wd} \) is mean daily weekday traffic volume
*\( V_{am} \) is mean morning (7-9am) traffic volume
*\( V_{mid} \) is mean midday (11am-1pm) traffic volume
Factoring Trail Traffic
Mixed-mode Patterns on Minneapolis Trails

Calculate factors in each region for utilitarian, recreational, mixed, and other (?) traffic patterns.
June 27-28 Trail Traffic
Minneapolis, Indianapolis, San Diego

Hourly Variation in Trail Traffic

Friday, June 27, 2014

Saturday, June 28, 2014

What’s happening in Indy in Broad Ripple on Fri-Sat nights?
A party factor group?
Modeling Trail Traffic

- Trail traffic is function of
  - Temporal variables
  - Weather
  - Neighborhood socio-demographics
  - Urban form
  - Trail characteristics
  - Accessibility to destinations
  - Integration into street network
- Goal: multiple, parsimonious models
Indianapolis Trail Traffic Models

Trail Network, Access Zones

Variables in OLS Models
(explain ± 80% of variation in daily traffic)

- Temporal
  - Weekend / weekday
  - Month-of-year
- Weather
  - Temperature
  - Precipitation (snow)
  - Sunshine
- Neighborhood
  - Household
  - Characteristics
    - Age
    - Race
    - Education
    - Income
- Urban Form
  - Population density
  - % Commercial land use
  - Parking lot area
  - Mean segment street length
- Trail Characteristics
  - Paved / unpaved
  - Greenness
  - Viewshed quality
  - # road Intersections
  - Sinuosity
  - Slope
  - Amenity density
Minneapolis Trail Traffic Models

Trail Monitoring Sites

Modeling Approaches

- **General model** – temporal, weather, neighborhood, urban form variables
- **Six location model**: temporal, weather, site dummy variables
- **Site specific model**: temporal, weather variables
## Minneapolis Trail Traffic Models

(Obligatory academic statistics slide: negative binomial regressions)

### Variables

<table>
<thead>
<tr>
<th>Variables</th>
<th>1-General Model</th>
<th>2-Six-location Model</th>
<th>Trail-specific Models 3-8</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n=1898</td>
<td>n=1898</td>
<td>n=427</td>
</tr>
<tr>
<td>Pseudo-R²</td>
<td>0.1329</td>
<td>0.1329</td>
<td>0.1162</td>
</tr>
<tr>
<td>(Constant)</td>
<td>-150.5***</td>
<td>4.331***</td>
<td>6.221***</td>
</tr>
</tbody>
</table>

#### Social Demographic Characteristics

<table>
<thead>
<tr>
<th>Variable</th>
<th>1-General Model</th>
<th>2-Six-location Model</th>
<th>Trail-specific Models 3-8</th>
</tr>
</thead>
<tbody>
<tr>
<td>blkpct</td>
<td>4.132***</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>collegepct</td>
<td>0.701***</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>yngoldpct</td>
<td>-0.195***</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>medincthd</td>
<td>1.650***</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

#### Built Environment

<table>
<thead>
<tr>
<th>Variable</th>
<th>1-General Model</th>
<th>2-Six-location Model</th>
<th>Trail-specific Models 3-8</th>
</tr>
</thead>
<tbody>
<tr>
<td>popden</td>
<td>0.007***</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

#### Weather Conditions

<table>
<thead>
<tr>
<th>Variable</th>
<th>1-General Model</th>
<th>2-Six-location Model</th>
<th>Trail-specific Models 3-8</th>
</tr>
</thead>
<tbody>
<tr>
<td>tmax</td>
<td>0.082***</td>
<td>0.082***</td>
<td>0.083***</td>
</tr>
<tr>
<td>maxdev</td>
<td>-0.033***</td>
<td>-0.033***</td>
<td>-0.039***</td>
</tr>
<tr>
<td>precip</td>
<td>-0.214***</td>
<td>-0.214***</td>
<td>-0.190***</td>
</tr>
<tr>
<td>windavg</td>
<td>-0.016***</td>
<td>-0.017***</td>
<td>-0.015***</td>
</tr>
</tbody>
</table>

#### Temporal Dummy

<table>
<thead>
<tr>
<th>Variable</th>
<th>1-General Model</th>
<th>2-Six-location Model</th>
<th>Trail-specific Models 3-8</th>
</tr>
</thead>
<tbody>
<tr>
<td>weekend</td>
<td>0.294***</td>
<td>0.294***</td>
<td>0.202***</td>
</tr>
</tbody>
</table>

#### Location Dummies

<table>
<thead>
<tr>
<th>Variable</th>
<th>1-General Model</th>
<th>2-Six-location Model</th>
<th>Trail-specific Models 3-8</th>
</tr>
</thead>
<tbody>
<tr>
<td>henn</td>
<td>-</td>
<td>1.894***</td>
<td>-</td>
</tr>
<tr>
<td>wrp</td>
<td>-</td>
<td>1.091***</td>
<td>-</td>
</tr>
<tr>
<td>cedar</td>
<td>-</td>
<td>2.033***</td>
<td>-</td>
</tr>
<tr>
<td>calhoun</td>
<td>-</td>
<td>2.377***</td>
<td>-</td>
</tr>
<tr>
<td>nokomis</td>
<td>-</td>
<td>1.607***</td>
<td>-</td>
</tr>
</tbody>
</table>
Models Estimate Trail Traffic Reasonably Well But Are many opportunities to improve model specification and results.
RTC T-MAP

• Tools for Change
  ✔ Connectivity
  ✔ Use
  ✔ Impact
• Timeline
  ✔ Modeling: June-December 2015
  ✔ Reporting: 2016
• Questions?
Thank you!

Tracy Hadden Loh, Ph.D.
Director of Research

2121 Ward Court, NW, 5th Floor
Washington, DC  20037

direct  202.974.5110
main    202.331.9696
fax     202.223.9257
e-mail  tracy@railstotrails.org
www.railstotrails.org
Our Investigators

Dr. Greg Lindsey
Dr. Thomas Gotschi
Dr. Tracy Hadden Loh
Dr. Mike Lowry